

8C). However, for the zoom in/out gesture (see FIG. 8D), the trace may be deleted, preferably, only after the fingertips have left the surface of the display 52.

[0063] In general, it can be appreciated that an aspect of this invention is the sequential creation of individual ones of a plurality of records, where individual ones of the plurality of records comprise data descriptive of a location of the user-manipulated physical object at a corresponding point in time while the gesture is executed.

[0064] Note that in the various exemplary embodiments discussed above the DP 16 may be any type of suitable data processor, such as one embodied within an integrated circuit, and the memory 18 may be any type of suitable data storage device, including semiconductor-based and magnetic disk- or tape-based data storage devices.

[0065] In FIG. 8 is depicted the “image” recorded by the image-capable display 52 of the user’s finger(s) in contact with the top surface of the display 52 when making the corresponding gesture. The feature labeled as 40 in FIG. 8 represents the current location (current image) of the user’s finger tip(s), while the feature labeled as 42 represents the prior images made during motion of the user’s finger tip(s), i.e., the finger tip trace that was referred to above. The arrows generally indicate the direction of motion of the finger tip 40.

[0066] The use of the display 52 can provide for one finger and multiple finger-based gestures to be recorded and processed in accordance with the exemplary embodiments of this invention. Several non-limiting examples are now provided.

[0067] One Finger-Based Commands/Protocols:

[0068] 1. Gesture: Clockwise (CW)—Contra Clockwise (CCW) Circular Rotations (see FIG. 8A)

[0069] Attributed Command: Browsing/Scrolling/Listing applications

[0070] 2. Gesture: Subsequent tapping by a single finger (Tap1-Tap1 . . . )

[0071] Attributed Command: Activate device/phone, Run/Execute pre-selected option

[0072] 3. Gesture: Finger stays motionless (over certain time threshold) above some object/icon

[0073] Attributed command: Select the object/icon

[0074] 4. Gesture: Finger stays above some item/object/icon/ followed by slow movement

[0075] Attributed command: Select the item/object/icon till end of the move

[0076] 5. Gesture: Crossed Perpendicular lines (X mark, see FIG. 8B)

[0077] Attributed command: Delete

[0078] 6. Gesture: Perpendicular moving breach (Check mark, see FIG. 8C)

[0079] Attributed command: Acceptance & Verification

[0080] 7. Gesture: Enclosed Curve around items/icons to be selected

[0081] Attributed command: Select group of items/icons

[0082] Two Finger-Based Commands/Protocols:

[0083] 8. Gesture: Linear approaching/digression(fingers approach, then move apart, and vice versa, see FIG. 8D)

[0084] Attributed command: Zoom-In/Out, Size adjustment

[0085] 9. Gesture: Simultaneous touching of an icon/object by two fingers

[0086] Attributed command: Select the icon/object ready for size adjustment

[0087] 10. Gesture: Simultaneous tapping by two fingers (Tap1&2, Tap1&2, repeated . . . )

[0088] Attributed command: High-level importance Acceptance & Verification

[0089] 11. Gesture: One finger stays above an icon/object then object-specific menu appears; the other finger performs circular rotations and toggles through the menu options, lifting simultaneously both fingers up selects and executes a menu option

[0090] Attributed command/application: Select & Execute a menu option

[0091] 12. Compounds

[0092] Appropriate combination of the basic gestures described above can be used to perform some of compound gestures such COPY, CUT, PASTE etc. For example;

[0093] COPY=SELECT+Check mark inside (performed in vicinity of selected item)

[0094] CUT=SELECT+X mark inside

[0095] PASTE is based on COPY assuming that an indicator of the clipboard content is visible on the screen after COPY, then one TAP on the clipboard may create PASTE command and paste the content at the pointer or pre selected item/icon

[0096] The protocols described above enable manipulation and/or selection of objects on the display 52 by movements of a user-manipulated physical object, such as one or more fingers. The use of these protocols provide a large input capacity as well as design freedom for gesture-based commands and language, which can also be used to exploit the full power of the device 50. Gaming devices can also benefit from their use.

[0097] Referring to FIG. 11, in accordance with the various embodiments of this invention described above it can be appreciated that there is provided a method that includes executing a gesture with a user-manipulated physical object in the vicinity of a device (Step 11A); generating data that is descriptive of the motion made by the user-manipulated object when executing the gesture (Step 11B) and interpreting the data as pertaining to (e.g., a command) at least one object that appears on a display screen (Step 11C).

[0098] Note that different input/output (I/O) technologies can be used to implement the gesture based protocols, from touch screen displays (2D detection systems) to 3D detection systems such as the UST embodiments discussed above, or camera-based systems, or camera-microphone based virtual keyboards. Structured light systems, such as laser-based light projection/detection systems, can also be used, as may a touch pad input device, as additional non-limiting examples.

[0099] The use of these exemplary embodiments of this invention provide display dominated concept devices with a minimal number of required keys, provide for realizing a gesture-based input device, and further do not require any significant hardware to be provided. In addition, the commands and their interpretation can be determined by software protocols. Also, the use of these exemplary embodiments of this invention provide a possibility for command customization by the user (personalization). For example, the user may define the Delete gesture to be one different than the one shown in FIG. 8B, such as by defining a circle with a diagonal line drawn through it to be the Delete gesture.

[0100] In general, and as considered herein, the motion made by the user-manipulated physical object may comprise